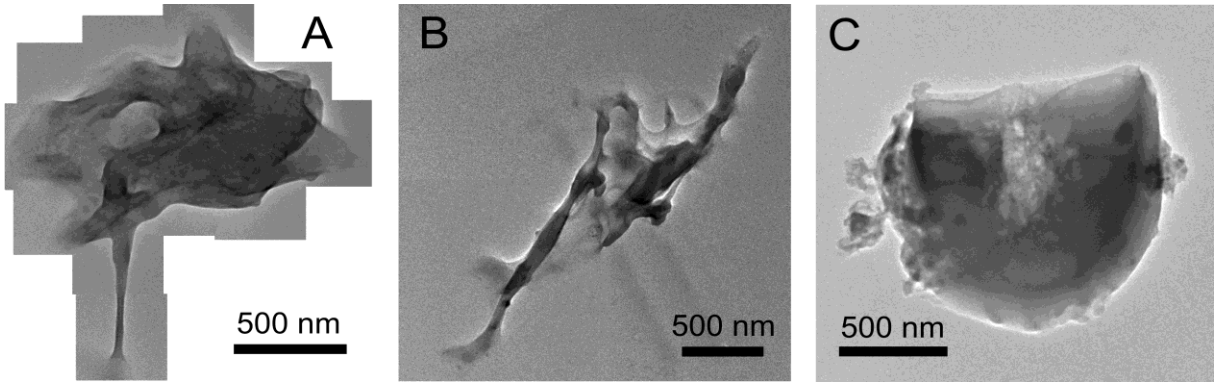
Study of Comet Particles Yields Surprises Good and Bad

- Scientists analyzed the chemical composition of several tiny grains retrieved from the comet 81P/Wild 2 by the NASA Stardust spacecraft and found that the samples are easily contaminated or modified during collection and preparations to ready the samples for study.



Transmission electron microscope (TEM) images of three cometary organic samples. (A) and (B) Two adjacent slices of one particle reveal dense carbon-rich matter free of contaminants from the aerogel. (C) A different carbon-rich particle in the form of a hollow globule.

- The results suggest that initial investigations of some of the grains may have yielded a false picture of their chemical makeup, but also confirm that Stardust can deliver relatively pure comet samples.

- At NSLS beamline X1A1, the researchers performed nanoscale x-ray absorption near-edge structure spectroscopy with a scanning transmission x-ray microscope to help them determine the grains' chemical composition.

- The images and data collected from the 12 samples studied show several cases in which materials identified during the preliminary examination phase are clearly contaminants, likely introduced by contact with the silica aerogel used to collect them and the process of cutting them into very thin slices for study. Just three of the 12 appear to contain mostly unaltered cometary material.

De Gregorio, et al., "Correlated microanalysis of cometary organic grains returned by Stardust," Meteoritics & Planetary Science,46, Nr 9, 1376–1396 (2011)